

## **Addressing Household Food Insecurity using the Household Food Insecurity Access Scale (HFIAS) in a Poor Rural Community in Sabah, Malaysia**

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**ABSTRACT** : Household food insecurity is defined as the lack of capability to produce food and to have access by all people at all times to enough food for an active and healthy life. The objective of this study was to evaluate household food insecurity status in Pitas town, Sabah, Malaysia. A sample of 102 households with the presence of mothers and at least one child between 1 and 5 years old were included. The respondents were interviewed with the use of a structured questionnaire to obtain information on their demographic, socioeconomic characteristics and dietary intake. 35.3% of the households were categorized as food secure, 28.4% as mildly food insecure, 27.5% as moderately food insecure and 8.8% as severely food insecure based on the Household Food Insecurity Access Scale (HFIAS) It is recommended that efforts to improve socio-economic status by enhancing the livelihood of the households in Pitas town need to be focused. More studies based on HFIAS scale should be carried out to generate more information in addressing household food insecurity among different ethnic groups in Malaysia.

**KEYWORDS** – Household Food Insecurity, Poor, Rural Community, Malaysia

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### **I. INTRODUCTION**

Household food insecurity is defined as the lack of capability to produce food and to have access by all people at all times to enough food for an active and healthy life [1] (Ishak and Othman, 2005). It has been shown to affect many dimensions of well-being[2] (Zalilah and Khor, 2008). It is related to lower macro- and micronutrient intakes, lower intakes of fruits and vegetables and lack of diet diversity[3] (Mohamadpour *et al.*, 2012). Food insecure households often have diets that are less diverse[4], [5] (Becquey *et al.*, 2010; Hadley *et al.*, 2011) and inadequate, perhaps of lower energy content, leading to poorer nutritional status [6] (Widome *et al.*, 2009). Less diverse diet and inadequate dietary intake means food consumption is limited in quantity and quality (or both) which may lead to deficiencies in nutrients [7] (Zalilah and Merlin, 2001). Both inadequate dietary intake (quantity and quality) and poor growth status are usually seen in children from low-income households as direct or indirect consequences of household food insecurity.

There are many factors contribute to household food insecurity. In many studies, low socioeconomic status has consistently been shown to be a risk factor [8], [2] (Zalilah and Tham, 2001; Zalilah and Khor, 2008). Food insecurity is a common problem among the low-income households as poverty is the principal cause of food insecurity [9] (Ahmed and Siwar, 2013). These households are always focused because of their lower socioeconomic status and vulnerability to food shortages which may affect the household's allocation of resources, particularly food, to household members [10], [7] (Naser *et al.*, 2014; Zalilah and Merlin, 2001). Other socioeconomic variables of the households such as larger household size, low education level, more children and school going children as well as mothers as housewives also affect the food security status of the households[11], [5], [12], [2] (Nnakwe and Yegammia, 2001; Hadley *et al.*, 2011; Martin and Lippert, 2011; Zalilah and Khor, 2008).

In order to address the issue of food insecurity status, there are various indicators available. In Malaysia, the 12-item questionnaire developed by Radimer/Cornell has always been adapted to access household hunger and food insecurity experienced at household, individual and child levels[7], [2], [13], [8] (Zalilah and Merlin, 2001; Zalilah and Khor, 2004; Zalilah and Khor, 2008; Zalilah and Tham, 2002). Each of the level acts as the determinant factors. [7]Zalilah and Merlin (2001) reported that there is no significant difference in children's nutritional status according to household food security levels. The diet quality and nutritional status of the children decreased as household food insecurity worsened [8] (Zalilah and Tham, 2002). Therefore, the measuring of child hunger cannot exactly access to household food insecurity because children

will always be the last one to go hungry in a food insecure household as adult will endure hunger themselves so that their children do not suffer [7], [2], [13] (Zalilah and Merlin, 2001; Zalilah and Khor, 2004; Zalilah and Khor, 2008).

By assuming a household's food allocation strategy, a nine-item Household Food Insecurity Access Scale (HFIAS) has been developed by The US Agency for International Development (USAID)-funded Food and Nutrition Technical Assistance (FANTA), which omits child-referenced questions and based on the idea that the experience of food insecurity causes predictable reactions and responses that can be captured and quantified through a survey and summarized in a scale [14] (Coates *et al.*, 2007). This allows researcher to classify households according to three broadly recognized, access-related domains which are uncertainty (worry about the household would not have enough food), insufficient food quality (includes variety and preferences of the type of food), and insufficient food quantity (includes insufficient food intake and its physical consequences such as go to sleep at night hungry because there was not enough food), rather than promoting threshold values based on singular response pattern [14], [15] (Coates *et al.*, 2007; Cooper, 2013).

As poverty is correlated to food insecurity, Sabah, a state of Malaysia, is currently afflicted with relatively high rates of poverty. It has the greatest prevalence of both overall as well as hardcore poverty which is an issue that needs to be urgently addressed. In 2004, 23% of households were below the poverty line. Meanwhile, 6.5% of Sabahan households are categorized as "hardcore poor" [16] (Sabah Development Corridor, 2007). While there have been some success in tackling this problem, there is still much to be done.

The purpose of this paper is to generate information mainly on the household food insecurity which is faced by the community in Sabah. Specifically, the paper will examine the associations between household food insecurity with demographic and socioeconomic variables as well as household dietary diversity. HFIAS which serves as the direct indicator in the study will provide the essential information of using it in Malaysia context.

## II. SUBJECTS AND METHODS

The study was conducted in the town area of Pitas. It is consisted of four villages namely *Kampung Barasan*, *Kampung Indah*, *Kampung Saab* and *Kampung Taka*. Based on the information which was updated in 2012 from Village Development and Security Committee (JKKK), there were 77 households (354 villagers) in *Kampung Barasan*, 59 households (342 villagers) in *Kampung Indah*, 39 households (353 villagers) in *Kampung Saab* and 40 households (300 villagers) in *Kampung Taka*. Each household had a minimum of five and maximum of 10 family members. The distances between these villages are very short which can be reached in approximately five minutes or less. *Kampung Barasan* and *Kampung Taka* are just besides each other. According to JKKK, both villages are going to be combined into one and *Kampung Taka* will become part of *Kampung Barasan*. *Kampung Indah* is located near to schools and hospital, hostels have been provided to government sector employees. Teachers and medical professionals such as doctors, medical assistance and nurses are focused in that area. Most of them have settled down and built their family there. *Kampung Saab* has the lowest number of households. The distribution of villages is more concentrated and is not as scattered as *Kampung Barasan* and *Kampung Taka*. Most of the people in Pitas town are Muslim-Bumiputera.

## III. SUBJECTS

The subjects were selected based on the household selection criteria. They included household with at least a child between 1 and 5 years old, presence of mother and willingness to sign a consent form to participate in the study. A total of 102 households (30 households from *Kampung Barasan*, 32 households from *Kampung Indah*, 25 households from *Kampung Saab* and 15 households from *Kampung Taka*) were chosen to be the subjects.

## IV. DATA COLLECTION

The information was collected through face-to-face interviews with the mothers. In situations where the mothers were not able to provide the required information, the spouses were interviewed to elicit the responses. Except in *Kampung Indah*, questionnaires were filled by the respondent themselves due to their busy working schedules (most of them are doctors and nurses). The questionnaire was translated to Malay for the present study. Due to the inherent sensitivity of the questions, interviews were conducted in private within respondent homes. Before conducting the interview, respondents were informed verbally regarding the purpose of the study and a consent letter was provided for the respondents to get their approval to participate in the study. They were assured that their personal information will not be disclosed in any way either in written or unwritten. The duration of the interview was about 30-45 minutes per household.

## V. DEMOGRAPHIC AND SOCIO-ECONOMIC INFORMATION

The demographic and socio-economic profiles collected from respondents comprised of marital status, number of children under the age of 5 and 18 years old, household size, parental education level, parental working status and household income.

## VI. HOUSEHOLD FOOD INSECURITY

A Malay language adaptation of the Household Food Insecurity Access Scale (HFIAS) was used as the direct food insecurity measurement tool in this study. Locally relevant phrases, definitions, and examples were elicited from key informants and professionals such as nurses and dietitian in Health Clinic Pitas to produce a tailored instrument. The scale covered three domains of food insecurity: (1) experiencing anxiety and uncertainty about the household food supply; (2) altering quality of the diet; (3) reducing quantity of food consumed.

The tool consisted of nine questions that ask about changes households made in their diet or food consumption patterns due to limited resources to acquire food in the preceding 30 days. The measurement followed a progression that begins with anxiety about food supply, followed by a decrease in the quality of food, a decrease in the quantity of food, and finally going to sleep hungry and going all day and night without eating. Table 1 showed the summary of the questions developed.

Four levels of food insecurity with increasing severity were reflected based on the nine items. They were food secure, mildly food insecure, moderately food insecure and severely food insecure. The internal consistency of the indicator in this study was 0.844.

**Table 1: Summary of the questions developed in HFIAS**

Question	Summary of the questions
1	Worry about food
2	Unable to eat preferred foods
3	Eat just a few kinds of foods
4	Eat food that they really do not want to eat
5	Eat a smaller meal
6	Eat fewer meal in a day
7	No food of any kind in the household
8	Go to sleep hungry
9	Go a whole day and night without eating

Source: [14] Coates *et al.*, 2007

### Household Dietary Diversity

Household Dietary Diversity Score (HDDS) was used as the indirect food insecurity measurement tool in the study. Primary food list was developed based on the guidelines that were provided by [15] Kennedy *et al.* (2010). Special emphasis was given to provide the common food consumed in Pitas town, Sabah. The common food items were categorized into twelve groups which covered (1) Rice, cereals, noodles; (2) roots and tubers; (3) fruits; (4) vegetables; (5) meats; (6) eggs; (7) fish and fish products; (8) beans and bean products; (9) milk and dairy products; (10) fats and oils; (11) sugars in beverages and confectionaries; (12) seasonings and drinks such as coffee and tea.

Mothers or the members who were responsible in food preparation in the households were asked how often they consume each item of food. If one of the members consumed a particular food groups in any time of the day (breakfast, morning tea, lunch, afternoon tea, dinner or supper) for more than three times a week for the past four weeks, a tick will be given on the column. The questions were referred to the household as a whole, not to any single member of the household.

## VII. DATA ANALYSIS

The statistical analysis of data was performed using the SPSS software, version 21.0. The demographic and socio-economic characteristic, were summarized using the descriptive statistics. Independent T-test and Pearson- $\chi^2$  analysis were used to identify the relationship between independent variables (demographics, socio-economic and household dietary diversity) with food insecurity status and its severity. Internal consistency of the scale was assessed using Cronbach's alpha. A scale with a coefficient of 0.7 or higher was considered reliable. Findings with a p-value <0.05 was considered to be statistically significant.

## VIII. RESULTS AND DISCUSSION

### Respondents' Demographic and Socio-economic Profile

Table 2 showed the data of respondents' demographic and socio-economic profiles. There were a total of 102 households participated in this study. 94.1% of them were married, given the very low rate of single or separated (5.9%). This implied that majority of the respondents would have additional responsibilities to their spouses and children. Among the respondents, majority of them had an average of 4 to 5 members (39, 38.2%) in a household, followed by 6 to 7 members (24, 23.5%) and 2 to 3 members (20, 19.6%). Majority of them have one child under the age of 5 years old with 58 (56.9%) of them and more than 4 children under the age of 18 years old with (30.4%) of them.

There were more than half of the respondents and their spouses achieved their highest formal education level at secondary school level which accounted for 61 (59.8%) and 54 (52.9%) of them respectively. Only 5.9% of the respondents did not have any form of education. This showed that majority of the respondents were literate which might enhance the food security status. In term of the household income, 31.4% of households possessed an average household income of less than RM711 per month, followed by 24.5% of them have an average household income of RM710 – RM1120 per month. In term of poverty line, the households in Pitas town are majority under the categories of hardcore poor and poor.

For the working status, there were 53.9% of the fathers were employed either from the government or private sector, 37.3% were self-employed and only 8.8% of them either do not work or absence. Different from the fathers, most (55%) of the mothers were housewives and they were categorized under group number three (do not work or absence) as they do not directly contribute to income generation to the households. 37% of them were employed and only 10% of them were self-employed.

**Table 2: Frequency on Demographic and Socio-economic Profiles**

<b>Variables</b>		<b>n (%)</b>
<b>Marital status</b>	Single	6 (5.9)
	Married	96 (94.1)
<b>No. of children &lt; 18 years old</b>	1 child	25 (24.5)
	2 children	24 (23.5)
	3 children	22 (21.6)
	4 children	15 (14.7)
	≥5 children	16 (15.7)
<b>No. of children &lt; 5 years old</b>	1 child	58 (56.9)
	2 children	28 (27.5)
	3 children	12 (11.8)
	≥4 children	4 (3.9)
<b>Father education level</b>	No primary education	3 (2.9)
	Primary education	25 (24.5)
	Secondary education	52 (51.0)
	Institution of higher education	19 (19.0)
<b>Mother education level</b>	No primary education	8 (7.8)
	Primary education	16 (15.7)
	Secondary education	62 (60.8)
	Institution of higher education	14 (13.7)
<b>Household size</b>	2-3 person	20 (19.6)
	4-5 person	39 (38.2)
	6-7 person	24 (23.5)
	8-9 person	15 (14.7)
	10-11 person	2 (2.0)
	≥11 person	2 (2.0)
<b>Household</b>	Hardcore poor (≤RM710)	32 (31.4)

<b>monthly income</b>	Poor (RM710-RM1120)	25 (24.5)
	Low (RM1121-RM2000)	13 (12.7)
	Moderate (RM2001-3000)	13 (12.7)
	High ( $\geq$ RM3000)	19 (18.7)
<b>Father working status</b>	Employed	55 (53.9)
	Self-employed	38 (37.3)
	Not working/absence	9 (8.8)
<b>Mother working status</b>	Employed	37 (36.3)
	Self-employed	10 (9.8)
	Not working/absence	55 (53.9)

< : less than

n : number of households

% : percentage of households

### IX. HOUSEHOLD FOOD INSECURITY STATUS

The level of food insecurity is established based on a score (sum of responses) and a classification of severity of food insecurity from the HFIAS scale. The score is the sum of the frequency-of-occurrence during the past four weeks for the nine food insecurity-related condition. The frequency-of-occurrence: rarely (once or twice in the past four weeks), sometimes (three to ten times in the past four weeks) and often (more than ten times in the past four weeks) are coded with 1, 2 and 3 respectively.

Responses to the HFIAS items were generally consistent. There was a decreasing percentage in the affirmative responses from the first question to the last question. This indicated that the severity of household food insecure was getting lower over the domain. More respondents reported affirmatively to the items indicating less severe food insecurity such as they have to eat a limited variety of foods due to the lack of resources, than to items indicating more severe food insecurity such as go a whole day and night without eating anything. The resources mentioning here were mainly referring to financial aspect. Two items most frequently receiving an affirmative response were question 1, “did you worry that your household would not have enough food?” and 3, “did you or any of your household members have to eat limited variety of foods due to a lack of resources?”. Both received 53.9% of affirmative responses. On the contrary, item receiving the least affirmative response (13.7%) was the last question which was also indicating the most severe food insecurity, “did you or any of your household members go a whole day and night without eating anything because there was not enough food?”. Table 3 summarized the distribution of affirmative responses to the nine items by the subject households in Pitass town.

**Table 3: Distribution of affirmative responses to items on the Household Food Insecurity Access Scale (HFIAS) in Pitass town**

Question	Yes	Rarely	Sometimes	Often
	%			
Domain: Anxiety and Uncertainty				
In the past four weeks, did you worry that your household would not have enough food?	53.9	8.8	34.3	9.8
Domain: Insufficient Quality				
In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	52	21.6	21.6	8.8
In the past four weeks, did you or any of your household members have to eat a limited variety of foods due to a lack of resources?	53.9	24.5	18.6	9.8

In the past four weeks, did you or any of your household members have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	37.3	19.6	13.7	5.9
Domain: Insufficient Quantity				
In the past four weeks, did you or any of your household members have to eat a smaller meal than you felt you needed because there was not enough food?	32.4	12.7	14.7	6.9
In the past four weeks, did you or any of your household members have to eat fewer meals in a day because there was not enough food?	27.5	9.8	12.7	6.9
In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	42.2	20.6	13.7	9.8
In the past four weeks, did you or any of your household members go to sleep at night hungry because there was not enough food?	14.7	3.9	6.9	3.9
In the past four weeks, did you or any of your household members go a whole day and night without eating anything because there was not enough food?	13.7	5.9	5.9	2

The score was then calculated based on the distribution of the responses to the nine items. The household food insecurity scores ranged from 0 to 27. The maximum score for a household is 27 and the minimum score is 0. The mean food insecurity score is  $6.0 \pm 6.65$ . This was a good phenomenon as the lower the score, the less food insecurity a household experienced [14] (Coates *et al.*, 2007).

Using the categorical measure of food insecurity, four levels of food insecurity had been identified which were food security, mildly food insecure, moderately food insecure and severely food insecure. Table 4 showed the frequency and percentage of each HFIAS category.

**Table 4: Prevalence of Household Food Insecurity (n=102)**

HFIAS categories	n (%)
Food secure	36 (35.3)
Mildly food insecure	29 (28.4)
Moderately food insecure	28 (27.5)
Severely food insecure	9 (8.8)
Total	102 (100.0)

n : number of households

% : percentage of households

About two-thirds of households (64.7%) were food insecure. That was they were, at times, uncertain of having or unable to acquire enough food for all household members because they had insufficient money and other resources for food. They were further categorized into mildly food insecure (28.4%), moderately food insecure (27.5%) and severely food insecure (8.8%). The remaining, 35.3% of households were food secure, meaning that they had access at all times to enough food for an active, healthy life for all household members.

Table 5 showed the Pearson's correlation coefficients between demographic and socio-economic characteristics with household food insecurity status, depicting the relationship between the variables. Two types of associations with the demographic and socio-economic variables were examined. They were household food security achieving and the severity of food insecurity. In other word, the first association was concerned about the effect of the demographic variables on achieving household food security status and the second association was concerned about the severity of household food insecurity provided the household was suffering from food insecure condition. A total of six variables were examined. They included marital status, number of children under 5 and 18 years old, paternal education level, household size, parental working status and household monthly income.

**Table 5: Association of Demographic and Socio-economic Characteristics and Household Food Insecurity Status**

Variables	Food secure	Mildly food insecure	Moderately food insecure	Severely food insecure	p value (a) <sup>1</sup>	P value (b) <sup>2</sup>
	n (%)					
<b>Marital status</b>					0.437	0.258
Single	3 (8.3)	0 (0.0)	2 (7.1)	1 (11.1)		
Married	33 (91.7)	29 (100)	26 (92.9)	8 (88.9)		
<b>Children under 18 years old*</b>					0.023	0.153
1 child	14 (38.9)	6 (20.7)	5 (17.9)	0 (0.0)		
2 children	5 (13.9)	10 (34.5)	8 (28.6)	1 (11.1)		
3 children	5 (13.9)	6 (20.7)	9 (32.1)	2 (22.2)		
4 children	8 (22.2)	3 (10.3)	3 (10.7)	1 (11.1)		
≥ 5 children	4 (11.1)	4 (13.8)	3 (10.7)	5 (55.6)		
<b>Children under 5 years old*</b>					0.027	0.055
1 child	26 (72.2)	17 (58.6)	14 (50)	1 (11.1)		
2 children	9 (25)	8 (27.6)	8 (28.6)	3 (33.3)		
3 children	0 (0.0)	4 (13.8)	5 (17.8)	3 (33.3)		
≥4 children	1 (2.8)	0 (0.0)	1 (3.6)	2 (22.3)		
<b>Father's education level*</b>					0.014	0.663
No primary education	1 (2.9)	1 (3.5)	1 (3.7)	0 (0.0)		
Primary education	4 (11.4)	7 (24.1)	10 (37.0)	4 (50.0)		
Secondary education	18 (51.4)	16 (55.2)	14 (51.9)	4 (50.0)		
Institution of higher education	12 (34.3)	5 (17.2)	2 (7.4)	0 (0.0)		
<b>Mother's education level</b>					0.062	0.830
No primary education	0 (0.0)	3 (15.8)	1 (4.8)	1 (14.3)		
Primary education	3 (13.1)	2 (10.5)	4 (19.0)	2 (28.6)		
Secondary education	15 (65.2)	13 (68.4)	15 (71.4)	4 (57.1)		
Institution of higher education	5 (21.7)	1 (5.3)	1 (4.8)	0 (0.0)		
<b>Household size*</b>					0.041	0.542
2 to 3	11 (30.6)	6 (20.7)	3 (10.7)	0 (0.0)		
4 to 5	9 (25)	13 (44.9)	14 (50)	3 (33.3)		
6 to 7	12 (33.3)	5 (17.2)	5 (17.9)	2 (22.3)		
8 to 9	3 (8.3)	5 (17.2)	4 (14.3)	3 (33.3)		
≥10	1 (2.8)	0 (0.0)	2 (7.1)	1 (11.1)		
<b>Father working status</b>					0.690	0.063
Employed	20 (55.5)	20 (69.0)	13 (46.4)	2 (22.2)		
Self-employed	14 (38.9)	8 (27.6)	12 (42.9)	4 (44.5)		
Not working/absence	2 (5.6)	1 (3.4)	3 (10.7)	3 (33.3)		
<b>Mother working status**</b>					0.000	0.001
Employed	23 (63.9)	7 (24.2)	5 (17.9)	2 (22.2)		
Self-employed	2 (5.5)	1 (3.4)	5 (17.9)	2 (22.2)		
Not working/absence	11 (30.6)	21 (72.4)	18 (64.2)	5 (55.6)		
<b>Household monthly income</b>					<0.001	0.226
Hardcore poor (≤RM710)	2 (5.6)	7 (24.1)	16 (57.1)	7 (77.7)		
Poor (RM710-RM1120)	6 (16.7)	11 (37.9)	6 (21.5)	2 (22.2)		
Low (RM1120-RM2000)	5 (13.9)	5 (17.2)	3 (10.7)	0 (0.0)		
Moderate (RM2001-RM3000)	9 (25)	3 (10.4)	1 (3.6)	0 (0.0)		
High (≥RM3000)	14 (38.9)	3 (10.4)	2 (7.7)	0 (0.0)		

<sup>1</sup>p value (a): Pearson Chi-Square to achieve food security

<sup>2</sup>p value (b): Pearson Chi-Square to compare the different levels of food insecurity

\* p value is significant at 0.05 level

\*\* p value is significant at 0.01 level

Although there were studies reported that single parenthood was associated with higher rate of food insecurity [15] (Nord *et al.*, 2004), in this study, however, marital status was not significantly correlated with the household food insecurity and the severity of household food insecurity. The reason for this may be because of the limited number of sample size collected for single parent family (six out of 102 households) and hence it cannot truly reflect the relationship with food insecurity.

Households with children under the ages of five and 18 showed significant ( $X^2=9.161$ ,  $p<0.05$ ;  $X^2=11.292$ ,  $p<0.05$ ) association to achieve food security status. In food-secure households, the rate of food secure is the highest for households with only one child under the age of 18 and under the age of five with 38.9% and 72.2% respectively. On the other hand, the rate of food secure is the lowest for households with more than five children under the age of 18 (11.1%) and three children under the age of five (0%). This implies that the higher the number of children, the lower the food security status. Food insecurity is more prevalent in larger families [2] (Zalilah and Khor, 2008) especially those with more children under the ages of 5 and 18 years old. Children growing up in food-insecure families are vulnerable to poor health and stunted development from the earliest stage of life [19] (Black *et al.*, 2008). No significant association was found to the severity of food insecurity regardless of the ages of the children presence. Hence, the number of children will affect the household to achieve the food security status, however, association with the severity of food insecurity was not significant ( $X^2=11.970$ ,  $p>0.05$ ;  $X^2=12.309$ ,  $p>0.05$ ).

This condition was due to the reason that the number of children affected the amount of food intake and dependency ratio, as children do not generate any income but depend only on the household head. Besides, it was reported that the food insecure households with children tend to spend approximately 80-90% of total expenditures on housing and food compared to 60-70% among the food secure households [13] (Zalilah and Khor, 2008). There are different expenditure needs for children under different ages. As the number of children under the age of 5 increases, more child expenditure on medical fee and dairy products such as milk will be needed while as the number of children under the age of 18 increases, expenditures primarily for general and education purpose are more focused.

Significant ( $X^2=10.542$ ,  $p<0.05$ ) association was found between father education level and household food insecurity status. This indicated that the father with higher education level had a lower HFIAS score. In other words, fathers with higher education level have better food security status compare to fathers with lower education level. This could be explained by the fact that a person with a diploma or a degree holder is able to secure a good job and has a higher income. It can also be observed that the households with household heads that have a low level of education (never attend school, primary school, and secondary school) tend to have the worst scores in comparison to the households with a better schooled household head (institution of higher education). Hence, it can be said that education can lead to a better household food security status. No significant association was found between father's education level and the severity of food insecurity.

On the contrary, it was surprising to note that mother's education level did not show significant association with household food insecurity. This was different from the previous studies that highlighted the contribution of maternal education level to a better food security status [16], [17], [18], [19] (Bhutta *et al.*, 2008; Ihab *et al.*, 2012a; Kaharuzza *et al.*, 2001; Nah and Chau, 2010). The possible reasons for this finding were probably due to the combined effect of basic food preparation knowledge and better access to food in town area. Husband may be the deciding factor to ensure the household food supply. Maternal buffering may also occur where mothers within the families would compromise their own nutrient needs to protect their children from food insufficiency as much as possible [20] (Ihab *et al.*, 2012b).

There was a significant ( $X^2=9.944$ ,  $p<0.05$ ) association between household size and household food insecurity status. This indicated that the larger the household size, the higher the HFIAS score. In other word, the larger the household size, the greater risk the household to suffer from food insecure. The study in Mexican [21] (Baer and Madrigal, 1993) reported that even when the household income was controlled, larger households were more food insufficient compared to smaller household. As indicated by [22] Olayemi (2012), the larger the family size the lesser food availability to each person within the household and also nutritional status is affected. Besides, the larger the family size the greater the responsibilities, especially, in a situation where many of the household members do not generate any income but only depend on the household heads [23] (Idrisa *et al.*, 2008). No significant association was found between household size and the severity of food insecurity.

In this context, only mother working status showed significant ( $X^2=18.353$ ,  $p<0.05$ ) association with household food insecurity status. According to [2] Zalilah and Khor (2008), mothers who were the income-earners contributed to better household food security status. The combination of their working experience and ability to



generate and control financial resources in the households allow them to ensure enough food supply for their family members. They also tend to manage income and food resources efficiently and be innovative in coping with household income or food insufficiency. Women with income-earning capacity may have more autonomy in household decision making that could be translated to better health and nutrition to their family.

Household income showed significant ( $X^2=34.792$ ,  $p<0.05$ ) association with household food security status. This revealed that when households have a higher income they have a better food security status. This was in consonance with the findings in [22] Olayemi (2012) which the association was significant at 0.01. This is primarily due to the inadequate income to buy sufficient foods for the household members. Low income households are vulnerability to food shortages which may affect the household's allocation of resources, particularly food, to household members [3] (Mohamadpour *et al.*, 2012).

**Household Dietary Diversity Score (HDDS)**

The overall HDDS mean score was 9.29. This was categorized in the high level diet diversity status. This indicated that households in Pitas town generally have a high level of diverse diet intake regardless of their food security status. Food secure households had a higher (mean=10.1) score as compared to food insecure households (mean=8.9). This indicated that food secure households had more diverse diet intake which provided sufficient nutrients to sustain food secure status and at the same time avoiding malnutrition such as vitamin A, iodine and folic acid that would bring adverse health effect[24] (Foote *et al.*, 2004).

The scores obtained from this study were generally higher compared to the other studies [25], [26] (FAO, 2004; Wiesmann *et al.*, 2008). This phenomenon may due to the difference in the method of data collection used. Respondents in this study were asked with the food they commonly take in the past four weeks whereas the information collected from the other studies were based on the previous 24-hour as a reference period (24-hour recall). Despite the methods used were varied, similar results were obtained. Food secure households often had wider diet variety compare to food insecure households. This was supported by the previous studies that [27]Hatloy *et al.* (2000) found out the dietary diversity was greater among households with higher socioeconomic status while[28] Basiotis and Lino (2002) found that food insufficient households had a worse diet quality, for instance, lower vegetable, fruit and milk and lack of food variety. Both poverty and food insecurity may reduce the household food budget, which consequently limited the access and procurement of foods of higher quality and wider variety.

Table 6 described the association of household food security status with HDDS. No significant ( $X^2=3.889$ ,  $p>0.05$ ) association was found between HDDS and household food security status. This meant that HDDS did not show relate significantly with the household food security status. It is however, significant ( $X^2=20.724$ ,  $p<0.05$ ) association was found between HDDS and the severity of household food insecurity status. Therefore, although HDDS cannot determine whether the household is food-secure or food-insecure, the different level of HDDS can determine the severity of household food insecurity.

The prevalence of poor household food diversity (categorized by low HDDS) was shown to be only in the category of severely food insecure. Food secure and mildly food insecure households reported high number of households (28 out of 36 and 20 out of 29 households respectively) with high HDDS. High level of diet diversity status decreases with the increasing severity of household food insecurity. From the social point of view, low-income households are impaired with their accessibility to more diverse, healthy foods [29] (Basto Lima, 2008). This resulted in frustration, anxiety and stress as reveal in the first question in HFIAS scale.

**Table 6: Association of household food insecurity status and HDDS**

HDDS	Food Secure	Mildly food insecure	Moderately food insecure	Severely food insecure	p value (a) <sup>1</sup>	p value (b) <sup>2</sup>
Low	0	0	0	3	0.143	.000
Moderate	8	9	11	3		
High	28	20	17	3		

<sup>1</sup>p value (a) for Pearson Chi-Square to achieve food security

<sup>2</sup>p value (b) for Pearson Chi-Square to compare the different levels of food insecurity

Considering that low socioeconomic status of the household may contribute to household food insecurity and consequently inadequate food intake (quantity and quality) by the household members [7] (Zalilah and Merlin, 2001), association between demographic and socio-economic variables with HDDS was examined using Pearson chi-square in this study. Table 7 illustrated the association between demographic and socio-economic variables with HDDS. The result showed that mother's education level, household monthly income, and parental working status were significantly ( $p<0.05$ ) associated with HDDS.

As reveal from the table, maternal education level significantly ( $X^2=14.129$ ,  $p<0.05$ ) associated with HDDS. Mothers with education (despite limited household resources) are more knowledgeable and aware of other available resources which will enable them to make the right choice among alternatives in relation to their family's well-being.

Both the working status of father and mother showed strong significant ( $X^2=20.815$ ,  $p<0.01$ ;  $X^2=17.972$ ,  $p<0.01$ ) association with HDDS. This indicated that parental working status significantly influence household diet diversity. As identified by [7] Zalilah and Merlin (2001), working parents are able to generate household income that would benefit the health and nutritional status of the family members through provision of adequate diets

**Table 7: Association of demographic and socio-economic variables with HDDS**

Variables	HDDS			p value <sup>1</sup>
	Low	Moderate	High	
<b>Marital status</b>				
Single	1	3	2	0.051
Married	2	28	66	
<b>Children under 18 years old</b>				
1 child	0	8	17	0.815
2 children	1	7	16	
3 children	1	5	16	
4 children	0	4	11	
> 5 children	1	7	8	
<b>Children under 5 years old</b>				
1 child	1	15	42	0.086
2 children	1	7	20	
3 children	1	8	3	
4 children	0	1	3	
<b>Father's education level</b>				
No primary education	0	2	1	0.077
Primary education	1	11	13	
Secondary education	1	15	36	
Institution of higher education	0	1	18	
<b>Mother's education level*</b>				
No primary education	1	5	2	0.028
Primary education	1	7	8	
Secondary education	1	18	43	
Institution of higher education	0	1	13	
<b>Household size</b>				
2 to 3	0	7	13	0.213
4 to 5	2	9	28	
6 to 7	0	8	16	
8 to 9	0	6	9	
more than 10	1	1	2	
<b>Household monthly income classification*</b>				
Hard-core poor	3	12	17	0.012
Poor	0	14	11	
Low	0	2	11	
Moderate	0	1	12	
High	0	2	17	
<b>Father working status**</b>				
Employed	0	11	44	.000
Self-employed	1	17	20	
Not working/absence	2	3	4	
<b>Mother working status**</b>				
Employed	0	6	31	0.001
Self-employed	2	3	5	
Not working/absence	1	22	32	

<sup>1</sup>p value is based on Pearson chi-square analysis

\*p value significant at 0.05 level

\*\*p value significant at 0.01 level

(quantity and quality). This increases the choice and diversity of food intake. [30]Blumberg (1988) reported that women have their own independent incomes and have control over their incomes, their self-esteem increases and they are more likely to spend their incomes primarily on items for daily household consumption or children's needs. The study of [31] Myntti (1993) found that women with healthy children had the opportunity to control and manage a portion of their husbands' incomes (they buy foods, supervise their husbands' spending, buy medicines, etc.) compared with mother with less healthy children. These studies show that women's access to and control of their own incomes or some of their spouses' incomes does contribute to better household food security and consequently to their family health.

The association of household income with the diet diversity score had also been examined. The result showed that there was a significant ( $X^2=25.653$ ,  $p<0.05$ ) association between household monthly income and HDDS. The level of income controlled by women has a positive impact on family dietary intake and nutritional status [32] (Kennedy and Peter, 1992). Interestingly, the percentage of high HDDS for hardcore poor family was the highest (53.1%) compared with the other two levels (37.6% and 9.3%). The moderate HDDS decreases with increasing household income. Low HDDS only reported in hardcore poor families. HDDS in the household income categories of low to high perform a stable high level of diet diversity status.

## X. CONCLUSION AND RECOMMENDATIONS

The present study evaluated household food insecurity among the rural community in Pitas town, Sabah. Results of the study indicated that about two-third of the households (64.7%) in Pitas town were in food insecure level. 28.4% of them were in mildly food insecure level, 27.5% were in moderately food insecure level and 8.8% were in severely food insecure level. The rest (35.3%) of the households were in food secure level.

In the light of the findings from the study, low socio-economic status is significantly associated with household food insecurity. Households with more children, low fathers education level, larger household size, working mother and household income were significantly ( $p<0.05$ ) associated with household food insecurity. Household dietary diversity status showed insignificant ( $p>0.05$ ) association with household food insecurity status. However, significant ( $p<0.05$ ) association was found between household dietary diversity status and the severity of household food insecurity.

It is recommended that efforts to improve socio-economic status need to be focused. The livelihood of the households in Pitas town can be enhanced by encouraging farming activities and empowering them with the knowledge such as farming techniques and soil preparation; capitals such as seeds, fertilizers and tools; and technical services such as consultation and support. These maximize the access to food and reduce dependency on food purchasing. Besides, investments on the training of small food producers can provide economic opportunities and generate income to buy affordable food.

In the study, HFIAS indicator is found relatively easy to analyze and interpret. In addition, it does not require qualified analysts and skilled interviewers in data collection and therefore less time and cost consuming. As the data for the use of this scale in Malaysia setting is not readily available, it is recommended that more studies, both qualitative and quantitative, to be carried out to generate more information in addressing household food insecurity among different ethnic groups in Malaysia.

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